2014 Wholesale and Networks

Alphonzo Samuels
Chief Technology Officer
Agenda

01 Landscape
02 Service Challenges
03 Network Transformation
04 Transformation Programme review
05 Technology
06 Wholesale
LANDSCAPE
The quality and reach of telecommunications infrastructure in South Africa has improved dramatically over the last decade. The most notable areas of improvement are:

- The number of undersea cables that have landed on our shores
- National and regional data backhaul networks being built out by Telkom and others
- Significant Metro and access fibre roll-out
- Satellite coverage covering the country and beyond; and
- Significant build out of mobile networks
Telkom's national fibre network

- Telkom has more than 147,000 km of fibre (largest footprint in SA – critical to support a nationwide deployment)
- 16,588 Fibre Distribution Points already enabling more than 100,000 services
- 948,868 ADSL subscribers
Telkom mobile 3G coverage reaches approx. 55% of the population

2428 sites on air
1165 LTE sites on air
2426 WiFi access points
Global Reach Connecting Our Customers to the World 24/7

Submarine cables (3-2-3)
- 3 gateways out of the country (Yserfontein, Melkbosstrand, Mtunzini)
- 2 rings around Africa (WACS/EIG/EASSY and SAT#/SAFE/SMW3)
- 3 diverse routes (WACS and SAT2/EIG and EASSY/EIG or SMW3)

Terrestrial fibre connects SADC countries
International IPNet
- POP’s (London, Amsterdam, NY, HK, Frankfurt)
- Our Global VPN extended coverage spans across 111 Countries and over 700 Cities globally

Satellite services
- 3 major earth stations
- Covering Africa
Drivers of Fault Rate and Repeat Report Rate (RRR)

Fault Rate and Repeat Report Rate impacting factors are diverse, for each product/service type, each with its own unique set of circumstances and challenges.
Where are the faults / “costs” in existing network?

No Fault
No fault found,
Upfront clears,
Right when tested

Home

Access
Cu Cable
Cu
Optical Fibre Cable
Fibre

Backhaul
ME

Core
Legacy PSTN
Softswitch IMS
IPConnect or SAIX
ISP 1
ISP 2
ISP 3
WWW

When we tested it, or arrived at the customer, the service was performing as required

| 25% to 30% | 10% to 15% | 45% to 50% | 5% to 10% | 5% to 10% |
2% of South Africa’s area concentrates 50% of population and 77% of national income

Mid and high income areas are highly concentrated in a few urban and suburban areas

59% of households represent 83% of total income
Vast geography and relatively dispersed customer base makes for a unique challenge...

<table>
<thead>
<tr>
<th>Area type</th>
<th>Disposable income</th>
<th>Broadband needs</th>
<th>Target solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban corp. &amp; business parks</td>
<td>Very high</td>
<td>High bandwidth requirements (&gt; 100Mbps)</td>
<td>FTTB &amp; PON</td>
</tr>
<tr>
<td>SMMEs, branch offices &amp; Campus</td>
<td>High</td>
<td>High bandwidth requirements (&gt; 100Mbps)</td>
<td>SHDSL, VDSL &amp; 2.6 GHz hotspots</td>
</tr>
<tr>
<td>Gated comm &amp; SOHO</td>
<td>Medium</td>
<td>High bandwidth requirements (10 - 100 Mbps)</td>
<td>PON &amp; VDSL</td>
</tr>
<tr>
<td>Urban suburban &amp; SOHO</td>
<td>Medium</td>
<td>Medium bandwidth requirements (10 - 40 Mbps)</td>
<td>ADSL2/2+ &amp; VDSL</td>
</tr>
<tr>
<td>Urban township</td>
<td>Medium-low</td>
<td>Low bandwidth requirements (4 - 10 Mbps)</td>
<td>3G/LTE in 2.1 GHz and 900 MHz</td>
</tr>
<tr>
<td>Farms, rural bus. &amp; game lodges</td>
<td>High</td>
<td>Low bandwidth requirements (4 - 10 Mbps)</td>
<td>LTE in 800 MHz and satellite</td>
</tr>
<tr>
<td>Rural settlements</td>
<td>Low</td>
<td>Very low bandwidth requirements (1 - 2 Mbps)</td>
<td>LTE in 800 MHz and satellite</td>
</tr>
<tr>
<td>Deep rural</td>
<td>Very low</td>
<td>Very low bandwidth requirements (less than 1 Mbps)</td>
<td>Satellite</td>
</tr>
</tbody>
</table>
Value Concentration and Geographic Challenges: Spectrum in the 700/800 Mhz

The propagation characteristics of spectrum

Relative CAPEX required for network infrastructure investment

Source: BBC R&D
NETWORK TRANSFORMATION

July 2014
### Telkom's transformation strategy

#### Voice centric
- Significant portion of the revenue coming from voice (and declining)
- Limited broadband capabilities on the back of legacy technologies (e.g. copper based)
- Low economies of scale limiting potential growth and affordable services
- Manual driven processes (ultimately driving high cost to serve)
- Slow to market – new lines and services
- Economically not sustainable

#### Data centric
- Revenue driven by data services (stabilizing revenue or growing)
- Future proof capabilities based on fibre technologies (e.g. FTTx) and mobile
- High economies of scale allowing high speed data intensive services at affordable prices
- Automated processes bringing efficiency and lower cost to serve
- Improved Speed to market & Enhanced services
- Focus on economically viable areas

---

Legacy technologies limit Telkom’s abilities to offer advanced data services at affordable prices

Strategy will enable ICT play through future proof more efficient technologies

---

‘One Network, all IP’
## Strategic Considerations

### Obsolescence
- **Voice**
  - E10
  - EWSD

### Broadband & Data
- **ATM**
- **ADSL**
- **Diginet**

### Revenue generation and protection
- **Consumer**
  - 60 : 40 revenue protection versus new revenue
- **Business**
- **Wholesale**

### Cost & Customer
- **Cost**
  - Utilities
  - Centralised Control & configuration
  - Combo ports
  - Cost per bit
- **Customer**
  - Lower fault rate
  - Higher speeds
  - Reputation: Fixed/mobile differentiation

### IT
- **Enhanced IT**
  - Cost avoidance
  - Product & services (rationalise legacy systems & applications)
  - Enable the improvement of customer experience
Multi Service Access Node (MSAN) is the chosen solution to revamp the access network

**MSAN solution**

The MSAN provides the ability to enable different service types, which target various segments from the same access node

- Four use cases differentiate four demand patterns
- International leading players’ best practices and industry trends have been used to benchmark the access solution

**MSAN specifications (non-exhaustive)**

MSAN enables a future-proof access network

- Addresses current and future demand requirements by being scalable and flexible
- Based on Next Generation Network technologies
- Aligned with international standards
- Specification based on evolving open standards, ensuring interoperability
- Upgradable to FTTx: Capability to support next generation xPON technology
- DSL standards
- Ethernet & Networking specifications
- Supports emerging voice protocols
The thickness of the copper cable determines the signal transmission loss per km, thus impacting on the maximum attainable speed for a given distance.
FTTx broadband architecture is our chosen path and best fit for SA

Revamp Access: The Options

Topology
- Central office to remote
- Remote to customer premises

Central office
- MSAN

FTTC

FTTx
- Copper
- Fibre

Technology
- ADSL
- ADSL2+
- VDSL2
- VDSL2 bonding vectoring
- Omega DSL
- B-PON
- G-PON
- Active Ethernet

Maximum speed (Mbps)
- 8
- 24
- 40
- 100
- 1,000
- 1,000 to 10,000

Current enablement
Upgradable enablement

Evolution of xDSL technologies will enable higher speeds in copper
### Transformation Progress

#### Revamp of access
- **FTTH (>100 Mbps)**
- **FTTC (40 Mbps)**
  - Local exchange upgrade and Fibre capabilities set
  - Wireless, Fixed-Wireless and Satellite access

#### Enhancement of aggregation
- Increased aggregation capacity and better customer experience

#### Evolution of core
- Access agnostic and Enabling Fixed-Mobile Convergence

#### Transmission network
- Evolved from Gbps to Tbps with resilience and manageability

#### International connectivity
- World-wide reach with superb capacity and resilience

#### IT
- Building a Service Orientated Architecture (SOA) for NG product and services

#### Operations
- State of the art network operations centre

---

Transmission network
- Evolved from Gbps to Tbps with resilience and manageability

International connectivity
- World-wide reach with superb capacity and resilience
### Current NGNEC rollout status

**FTTC Active Ports = 574,288**

**FTTH/B Homes Passed = 1,733**

---

| 1 | Revamp access  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Enable differentiated broadband product</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | - FTTC  
| |   - Remote sites = 455 (239,152 ports)  
| |   - 139 Remote sites waiting cut-over = 66,813 ports  
| |   - 42 remotes sites in store (no power)  
| | - FTTH/B  
| |   - 6 x TPoC sites for FTTH/B completed  
| |   - Homes passed 1,524  
| |   - Homes connected 16  
| | - **Downtime improvement**  
| | - **Fault reduction** |  |

| 2 | Enhance aggregation  
|---|---|---|
| | **Protect business data revenue**  
| | **Decommission legacy P&S** |  |
| | - New NG BRAS (BNGs) deployed  
| | - Additional Metro Ethernet nodes have been deployed  
| | - Identified buildings which has existing fibre or requiring fibre to be provided.  
| | **Future**  
| | Reevaluate present technology & vendors of core IP & Transport networks |  |

| 3 | Migrate voice  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Mitigate risks resulting from end-of-life equipment</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | - Central Offices = 51 (251,232 ports)  
| | - One Central Office decommissioned  
| | - 7 additional central offices deployed representing 54,958 ports  
| | - 3 FTTH/B enabled C.O.  
| | - Utility savings |  |

| 4 | Evolve core  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Enable multi access technology management and multiservice control</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | - IMS phase 1 completed  
| | - IMS Phase 2 to commence  
| | - Develop future plan for the convergence fixed and mobile plans  
| | **Future**  
| | Reevaluate present technology & vendors of core IP & Transport networks |  |

| 5 | Overhaul OSS/BSS  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Meet next generation customer experience demands</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Continual improvements in a phased approach based on services and efficiency introduced.</td>
<td></td>
</tr>
</tbody>
</table>

| 6 | Enable innovation  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Enable new business models</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | - 20 & 40 meg services  
| | - Legacy Diginet (n * 64k) replacement with Ethernet being `developed  
| | - FTTH/B products being developed  
| | - New training systems |  |
TRANSFORMATION PROGRAMME REVIEW
FTTH / LTE MIX
The journey to a future-proof network is based on a comprehensive set of interventions. Investment in the revamp of access is the crucial last step and the most challenging.
NGN and LTE are able to answer the growing demand for higher bandwidths of several applications.

Basket of services per bandwidth (Mbps)

- **VoIP**
- **Browsing**
- **OTT**
- **HD TV**
- **2x HD TV**
- **4k TV**

Access network capacity:

- **ADSL 2+**
- **VDSL 2**
- **LTE**
- **G-PON**

Today’s Home | Future Homes
Review in progress to provide high speed Broadband access using LTE technology in/as fixed wireless solution
Telkom announced on 13 June 2014 plans to roll out FTTH connectivity to over twenty suburbs. Commercial launch of basic voice & broadband FTTH/B to enable the sale of up to 100Mbps resell DSL by October 2014.
Network Topology showing Copper, FTTC and FTTH/B Access

- **Copper**: Copper Cable, Copper loop / sub-loop
- **FTTC**: xDSL Modem, Fiber loop / sub-loop
- **FTTH/B**: IAD, ONT, FTU, Fiber loop / sub-loop
- **LTE**: 3G / LTE base station

Key Components:
- **Exchange**: Metro Ethernet, BRAS/BNG
- **PSTN**: VoIP, IMS
- **TCNet VPN**: Softswitch
- **Content Network?**
- **Aggregation & Core Network**: IPConnect or SAIX, FTTH/B
IMS Enablement

- Access layer
  - GSM
  - Satellite
  - LTE

- Transport layer
  - MSAN
  - PSTN
  - PRI
  - ADSL

- IMS core layer
  - HSS
  - SIP AS
  - MRF
  - PCRF
  - CSCF
  - MGCF

SIP Trunk

IMS Enablement

Telkom
Extend Ethernet / Metro Ethernet as close as possible to the customer, especially business customers.
WHOLESALE
Strategy

- To become the Wholesale Provider of choice, a leader in Broadband and Connectivity Services - Your Partner in Business.

Repositioning of Telkom Wholesale by:

- Secure long term agreements with key MCO's and OLO's
- Evaluate adjacent growth areas and define opportunities
- Advance Wholesale Sales and Business Development Capabilities
Successful wholesalers have managed to develop their non-voice revenue, both locally and internationally.

<table>
<thead>
<tr>
<th></th>
<th>Global wholesale markets trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Most of the wholesale revenue in mature markets is non-voice related</td>
</tr>
<tr>
<td>2</td>
<td>FTTH better allows incumbents to defend their investment</td>
</tr>
<tr>
<td>3</td>
<td>Fixed incumbents have an opportunity to enable digital players’ CDN strategies</td>
</tr>
<tr>
<td>4</td>
<td>Successful wholesalers have managed to extend their activities internationally</td>
</tr>
</tbody>
</table>
The current wholesale revenues in mature markets are mostly generated through non-voice products.

Evolution of European incumbent wholesale revenue mix

Source: OVUM, Oanda.com, Delta Partners analysis

1 Includes Transit voice, Wholesale line rental, Pre-selection, etc. – Excludes interconnection terminating on the operator network;
2 Includes data connectivity services (WDM, ATM, Frame Relay, Ethernet, etc.), access services (DSL, fibre, etc.), infrastructure (e.g. dark fibre) and VAS (e.g. CDN, hosting, etc.);
3 Includes services to MCOs, MVNOs and MVNEs and wholesale mobile-originated voice traffic;
4 ZAR/USD exchange rate: 7 (2011) and 8.5 (2012);
5 based on BT and FT revenue -
Mobile market has been growing faster than the fixed line market in both in voice and broadband.

Source: Globalcomms

Source: GSMA Intelligence 26/06/2014
Commercialisation of New Products

Telkom Wholesale is expanding its connectivity offerings by strengthening its overall propositions with relevant value added services.

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Connectivity</th>
<th>VAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>City to City Intl. Fiber Optic</td>
<td>Bitstream NGA and VULA1</td>
<td>Data Center</td>
</tr>
<tr>
<td>Diginet</td>
<td>Wholesale Line Rental</td>
<td>CDN</td>
</tr>
<tr>
<td>Ethernet (Metro &amp; Express)</td>
<td>P2P Ethernet and SDH</td>
<td>Bulk SMS</td>
</tr>
<tr>
<td>SAIX</td>
<td>TDM Interconnect</td>
<td>Managed Security</td>
</tr>
<tr>
<td>IP Connect</td>
<td>Satellite</td>
<td>VOD (VideoRise)</td>
</tr>
<tr>
<td>Intl. Private Leased Lines</td>
<td>Giganet (&amp; shared Giganet)</td>
<td>IPTV3</td>
</tr>
<tr>
<td>Megalines</td>
<td>VoIP</td>
<td>Cloud Services (white label)</td>
</tr>
<tr>
<td>Resell ADSL</td>
<td>Easy IP ADSL</td>
<td></td>
</tr>
<tr>
<td>VPN (layer 2)</td>
<td>Voice</td>
<td></td>
</tr>
<tr>
<td>Voice hubbing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Operator reports, Operator websites

Non-exhaustive